

1       1. A transmission element for transmitting information between downhole tools located  
2       on a drill string, the transmission element comprising:

3               an annular core constructed of a magnetically-conductive material;

4               at least one conductor coiled around the annular core and electrically isolated  
5       therefrom;

6               an annular housing constructed of an electrically conductive material and partially  
7       enclosing the annular core and the at least one conductor;

8               the annular housing further shaped to reside with an annular recess formed into a  
9       surface of a downhole tool, and being electrically insulated from the surface thereof;

10              a biasing member to effect a bias between the annular housing and the annular  
11       recess, urging the annular housing in a direction substantially perpendicular to the  
12       surface.

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14       2. The transmission element of claim 1, further comprising a retention mechanism for  
15       retaining the annular housing within an annular recess.

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17       3. The transmission element of claim 1, wherein the at least one conductor is coated with  
18       an electrically insulating material.

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20       4. The transmission element of claim 1, wherein the surface is selected from the group  
21       consisting of a secondary shoulder of a pin end, a secondary shoulder of a box end, a  
22       primary shoulder of a pin end, and a primary shoulder of a box end of a downhole tool.

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24       5. The transmission element of claim 1, wherein the annular housing is at least partially  
25       exposed to the central bore of a downhole tool;

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27       6. The transmission element of claim 1, wherein the biasing member is selected from the

1 group consisting of a metal spring, an elastomeric material, and an elastomeric-like  
2 material.

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4 7. The transmission element of claim 1, wherein the annular core is characterized by an  
5 elongate cross-section.

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7 8. The transmission element of claim 1, wherein the annular core has a cross-section  
8 characterized by a height at least twice that of its width.

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10 9. The transmission element of claim 1, wherein the annular housing further comprises a  
11 shoulder formed along the exterior thereof, configured to engage a corresponding  
12 shoulder formed within an annular recess.

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14 10. The transmission element of claim 1, wherein the annular housing is configured to  
15 make electrical contact with a second annular housing located on a second transmission  
16 element, and wherein the contact surfaces of each annular housing are formed to be self-  
17 cleaning.

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1       11. A transmission element for transmitting information between downhole tools located  
2       on a drill string, the transmission element comprising:

3              an annular core constructed of a magnetically-conductive material;  
4              at least one conductor coiled around the annular core and electrically isolated  
5       therefrom;

6              an annular housing constructed of an electrically conductive material and partially  
7       enclosing the annular core and the at least one conductor;

8              the annular housing further shaped to reside with an annular recess formed into a  
9       surface of a downhole tool, and being electrically insulated from the surface thereof;

10             means for effecting a bias between the annular housing and the annular recess;

12       12. The transmission element of claim 11, wherein the means for effecting a bias  
13       between the annular housing and the annular recess is due to radial tension between  
14       surfaces of the annular housing and an annular recess.

16       13. The transmission element of claim 12, wherein the radial tension between the  
17       surfaces of the annular housing and the annular recess are due to tension along at least  
18       one of the outside diameters, the inside diameters, and a combination thereof, of the  
19       annular housing and annular recess.

21       14. The transmission element of claim 11, further comprising a retention mechanism for  
22       retaining the annular housing within an annular recess.

24       15. The transmission element of claim 11, wherein the annular housing is at least  
25       partially exposed to the central bore of a downhole tool;

1       16. An apparatus for transmitting information between downhole tools located on a drill  
2       string, the apparatus comprising:

3               a first transmission element, mounted to the end of a first downhole tool, the first  
4       transmission element comprising a first contact;

5               a second transmission element, mounted to the end of a second downhole tool  
6       connectable to the first downhole tool, the second transmission element comprising a  
7       second contact configured to physically contact the first contact upon connecting the first  
8       and second downhole tools; and

9               an isolation mechanism configured to isolate the first and second contacts from an  
10      adjacent environment when contact occurs between the first and second contacts.

12       17. The apparatus of claim 16, wherein the isolation mechanism further comprises:

13               a first isolation component connected to the first transmission element; and  
14               a second isolation component connected to the second transmission element, the  
15       second isolation mechanism configured to engage the first isolation mechanism upon  
16       connecting the first and second downhole tools.

18       18. The apparatus of claim 17, wherein the first and second isolation components are  
19       annular housings having substantially U-shaped cross-sections and are formed to reside  
20       within annular recesses formed in the first and second downhole tools, respectively.

22       19. The apparatus of claim 18, wherein the first and second contacts are conductive rings  
23       formed to reside within the first and second annular housings, respectively.

25       20. The apparatus of claim 19, wherein the conductive rings are electrically insulated  
26       from the first and second annular housings, respectively.

1       21. The apparatus of claim 19, wherein the conductive rings are coupled to the first and  
2       second annular housings, respectively, by at least one of a resilient, an elastomeric, and  
3       an elastomeric-like material.

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